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GAGE-PATTY CAKE RADAR SITES PROBABLY ASSOCIATED WITH MOSCOW AIR-DEFENSE SYSTEM

PIC/R-4/60

MAY 1960

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PIC/R-4/60

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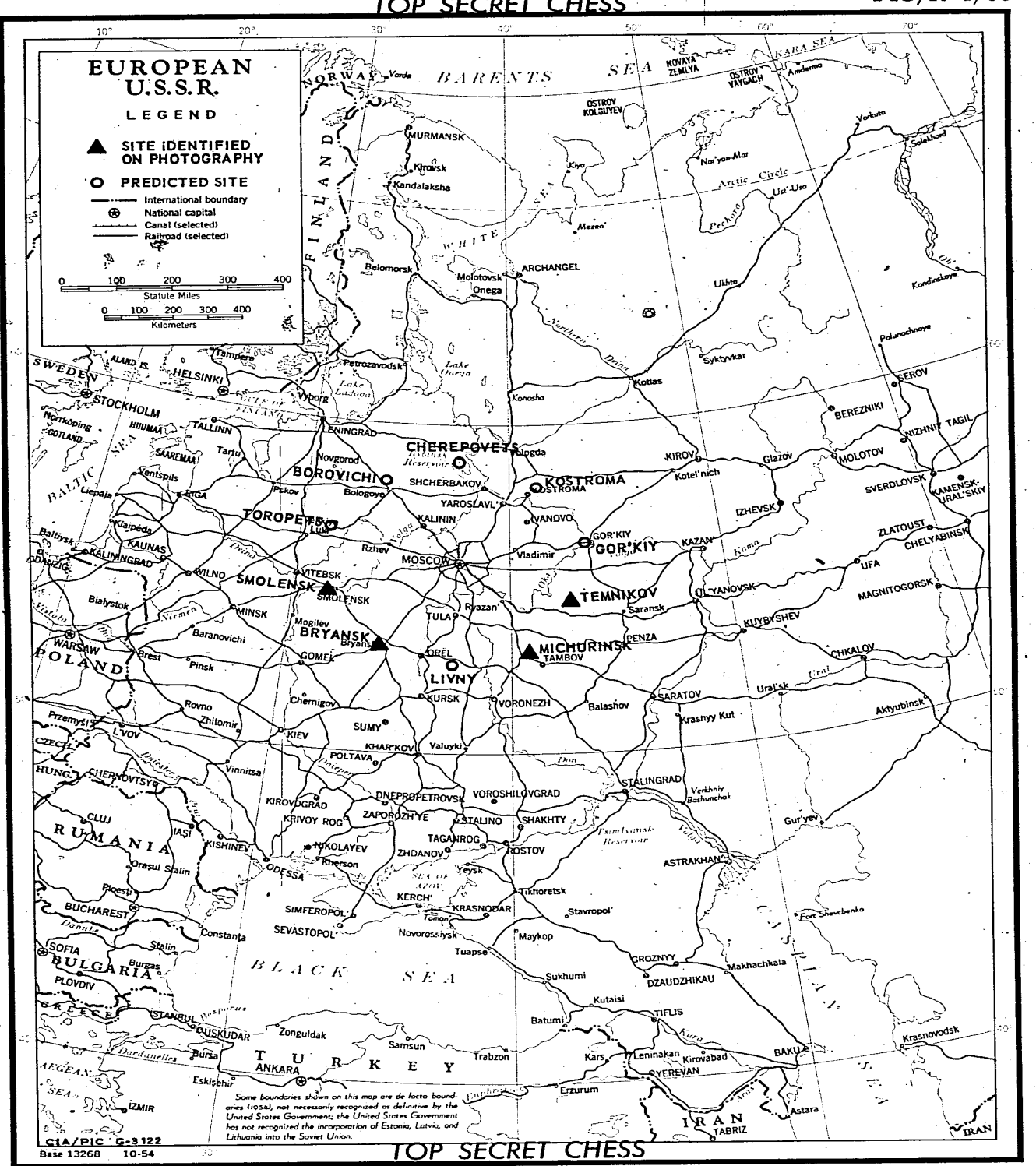

FIGURE 1. MAP SHOWING LOCATION OF GAGE-PATTY CAKE RADAR SITES POSITIONED ON 200-NM-RADIUS CIRCLE AROUND MOSCOW. See Figure 8 for location of 14-nm sites.

INTRODUCTION

A total of six radar sites, each containing GAGE, PATTY CAKE, CROSS OUT/BAR LOCK, and ROCK CAKE/STONE CAKE radars, have been identified on photography in the European USSR. The location of sites in relation to Moscow indicates that they are probably associated with the Moscow air-defense system.

25X1B

[redacted]

The other two radar sites -- near Kotovo and Odintsovo -- are 14 nm from Moscow. Since only these two sites have been identified, the existence of a 14 nm ring of sites has not been confirmed. GAGE with other radars, however, have been reported near Khimki, Izmaylovo, and Makarovo, roughly 14 nm from Moscow. 2/

200-NM RADAR SITES

Three of the 200 nm sites (Michurinsk, Temnikov, and Smolensk) are similar in design and contain a secured (double-fenced) operations area and a nearby fenced support area. Each operations area includes up to seven radars, an operations bunker, operational support structures, and probable transmitting and receiving antennas oriented toward Lozhki, 26 nm northwest of Moscow. The support areas contain single-family-type housing

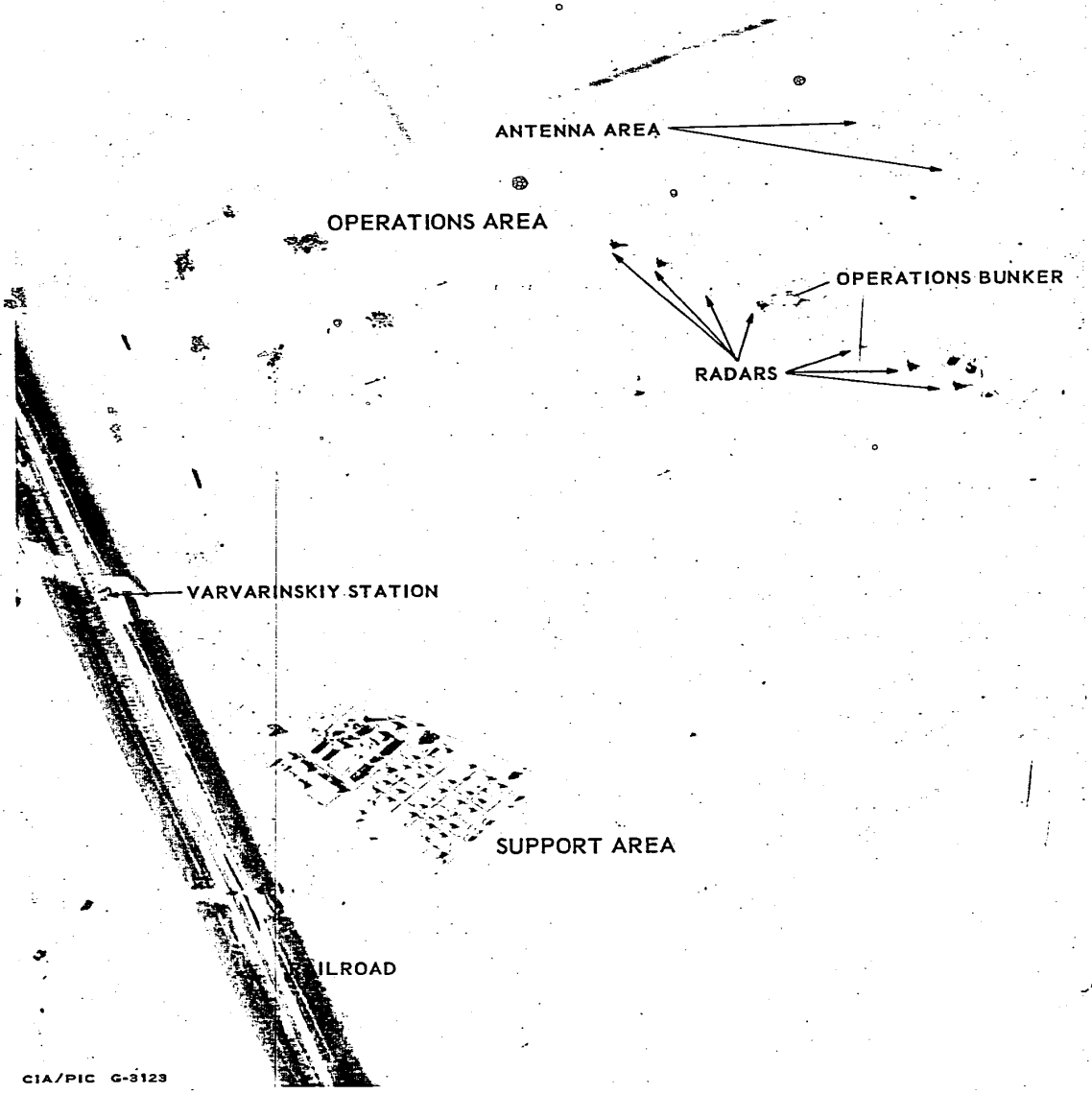

FIGURE 2. MICHURINSK RADAR SITE. The facilities within the support area are typical of all identified sites. Date of photography, [redacted]

25X1D

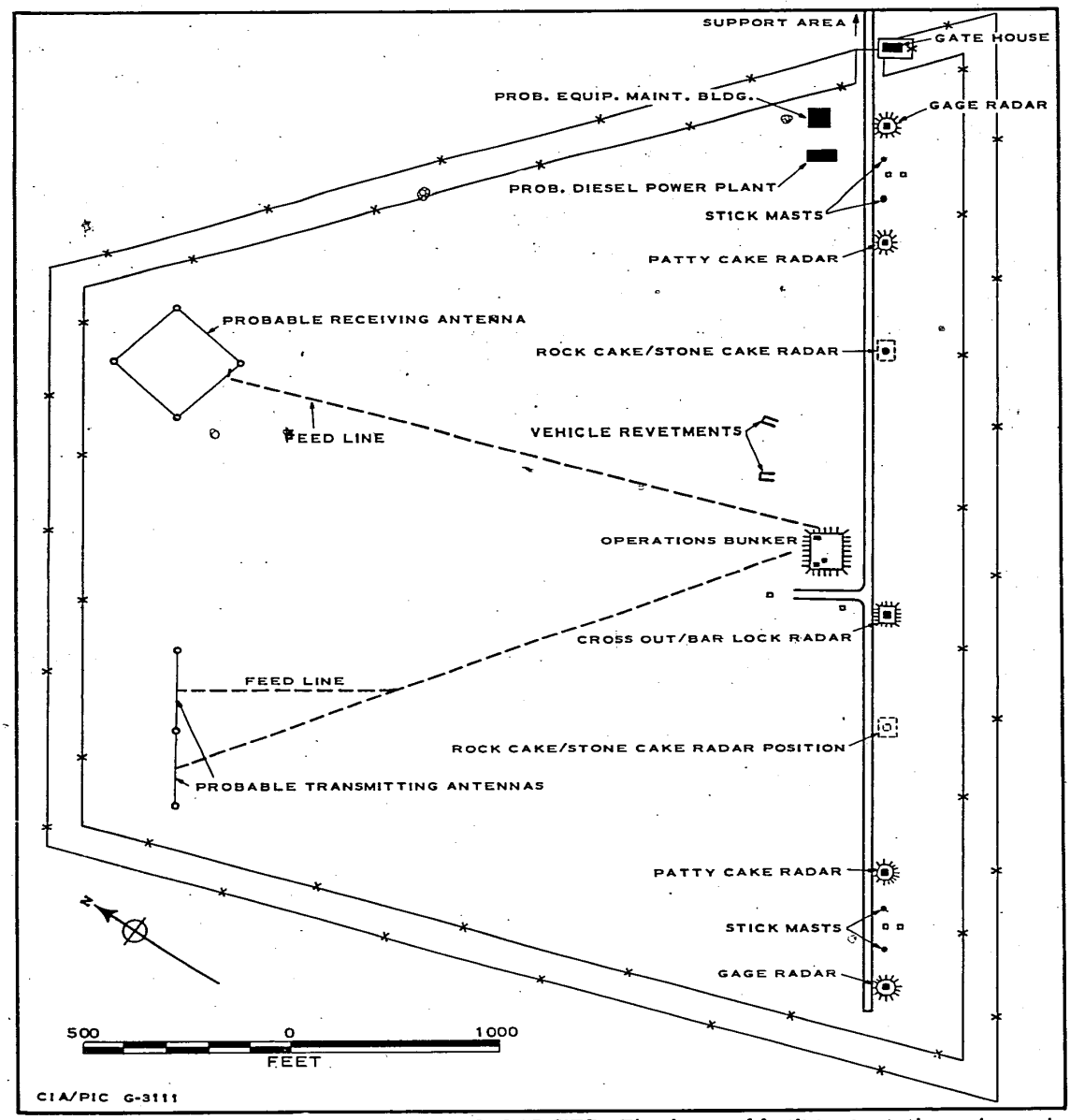

FIGURE 3. OPERATIONS AREA, MICHURINSK RADAR SITE. This layout of facilities is similar to that at the Smolensk site.

units, barracks, and recreation and utility facilities. Visible facilities at the fourth site, near Bryansk, which is only partially covered by photography, include four radars and an operations bunker.

MICHURINSK RADAR SITE

The radar site near Michurinsk, covered by aerial photography of [redacted] 25X1D
25X1D [redacted] is located 5.5 nm east-northeast of the city at 52°55'N/ 40°39'E (Figure 1). The site is on level, cleared ground (former Tapinka Airfield) 525 feet above sea level and is served by an improved road from Michurinsk. A double-track rail line runs adjacent to the site, and Varvarinskiy station 3/ (a passenger stop) is nearby. A view of the site from the rail line would be obscured by a windbreak of trees planted along the railroad.

The radar site has two components (Figure 2): a double-fenced operations area and a single-fenced support area, 0.5 nm apart and connected by an improved road 20 feet wide. The operations area is served by a telegraph/telephone line from a line along the railroad. The support area is served by a telegraph/telephone line from Varvarinskiy station and by a power line.

Operations Area

The double fence enclosing the operations area (Figure 3) is trapezoidal in shape. The outer fence lines measure 3,050, 2,400, 1,620, and 2,400 feet and enclose an area of 129 acres. The area contains seven radars, an operations bunker, a gatehouse, and operational support structures including a probable diesel power plant and a probable equipment-maintenance building -- all located along a road near the southeastern fence. Two probable transmitting antennas and a probable receiving antenna are located along the northwestern fence. [redacted]

25X1B 25X1B

25X1B

[redacted]

ations bunker. The communications antennas are more than 1,650 feet from the radars, and the telegraph/telephone line is apparently underground within 1,650 feet of the radars.

Radars: The seven radars in the operations area include two GAGE, two PATTY CAKE, two probable ROCK CAKE/STONE CAKE, and one CROSS OUT/BAR LOCK. Prepared positions for all radars are in a line along the road. None of the radar reflectors has any apparent movement.

The GAGE and PATTY CAKE radars are positioned on individual earth mounds, each approximately 20 feet high. These radars are in two identical groups, each group containing a GAGE and a PATTY CAKE. The GAGE is 330 feet from the PATTY CAKE in each group, and the groups are 1,780 feet apart. The mound for each radar probably covers an equipment bunker which has an entrance [redacted] on the road side and a smaller entrance on the opposite side. Each equipment bunker has two probable ventilators. Between and aligned with the radar mounds in each group are two stick masts, each approximately 85 feet high. Two small structures, each approximately 5 by 5 feet, are located between the stick masts. Similar-type masts are utilized at power substations as lightning arresters and at many radar sites as communications antennas.

25X1D

Between the GAGE and PATTY CAKE radar groups is a probable ROCK CAKE/STONE CAKE radar on a prepared position at ground level, a CROSS OUT/BAR LOCK radar on a flat-topped mound 55 by 40 feet, and a vacant prepared position for another probable ROCK CAKE/STONE CAKE radar. The radar for this position is parked near the operations bunker and does not have the sail assembled.

Operations Bunker: The operations bunker, located adjacent to the mid-point of the road through the operations area, is flat-roofed and revetted and measures 110 by 80 feet. The bunker is similar to launch-control bunkers at the Kapustin Yar Missile Test Center.

The bunker has a main entrance on the south side and a possible emergency exit on the east side. The feed line for the probable transmitting antennas connects through the west side and the feed line for the probable receiving antenna connects through the north side. Two possible vents and a possible whip mast are positioned on the roof.

Operational Support Structures: Near the road entrance is a single-story, gable-roofed probable diesel power plant measuring 55 by 30 feet. Three vents are on the roof, and nearby are three possible horizontal cylindrical tanks.

A single-story probable equipment-maintenance building, 45 by 45 feet, with a low-pitched gable roof is located near the probable power plant. Between the inner and outer fences at the road entrance is a single-story
25X1D gable-roofed gatehouse, 25 by 15 feet.

Two vehicle revetments (possibly abandoned) are visible 250 feet and 350 feet, respectively, northeast of the operations bunker. A total of 14 [redacted] scattered around the operations bunker, power plant, and GAGE, PATTY CAKE, and CROSS OUT/BAR 25X1D
LOCK radars, but not near the ROCK CAKE/STONE CAKE radar positions. These objects are in locations where underground power-line bends or
25X1D junction boxes might be anticipated, but it would not be expected [redacted] required at these points. Along the outer fence 300 feet west of the road entrance is a stick mast 25 feet high.

Communications Antennas: The communications antennas, located in the northwestern part of the operations area, include two probable transmitting antennas and one probable receiving antenna. The transmitting antennas are 670 feet from the receiving antenna. The two probable transmitting antennas are believed to be horizontally polarized, center-fed single wires, multiple wires, or cages supported by three masts in a line, each
25X1D 50 feet high, and separated [redacted] The antennas may operate on different frequencies since the pole-to-pole distances vary
25X1D [redacted] A perpendicular bisector of these antennas is on an azimuth of

25X1D [redacted] The Kremlin (Moscow) is on an azimuth of [redacted] 25X1D from the site at a distance of 202 nm. A feed line, supported by 15-foot-high poles spaced 70 feet apart, leads from the operations bunker to a pole 520 feet from the antennas. This pole has an attached junction box. Separate feed lines lead from the junction box to probable impedance-matching stubs located at the mid-point of each antenna.

The probable receiving antenna is believed to be a single rhombic supported by four masts, each 50 feet high, forming a square [redacted] on a 25X1D side. A feed line, supported by 15-foot-high poles 35 feet apart, leads from the operations bunker to a point within the rhombic and then angles over to a probable matching/flaring stub near one of the masts. This antenna is probably the second at this location; the former one consisted of possibly two parallel, center-fed, horizontally polarized dipoles. The feed line led through the center of the former antenna. Although the location of the antenna masts have been shifted, the feed line remains in the same position, accounting for a bend near its present terminus. The orientation of the 25X1D probable former antenna was [redacted] and the orientation of the present 25X1D rhombic antenna is [redacted]

Although the masts for the receiving antenna could accommodate horizontally polarized dipoles, the existing feed-line termination indicates the use of a rhombic (see Temnikov Radar Site, below, for further indications). This rhombic, however, is unusual, since its major axis is approximately the same as its minor axis and the tilt (side apex) angle approximates 45 degrees. A rhombic of similar design is described in G. S. Ajsenberg's book Kurzwellen-Antennen, dated 1954, which states that a rhombic with a tilt angle of 45 degrees, a side length of 1.0λ, and an antenna height of 0.35λ is used for receiving over a short distance of 400-600 km (200-300 nm).

The rhombic antenna at this radar site has a tilt angle of 45 degrees, but the ratio of side length to antenna height is 1/0.24, or 1.48/0.35, rather than the described design ratio of 1/0.35. This difference in ratio may be a

practical expedient at the site. The identification of the rhombic as a receiving antenna and the horizontal wires as transmitting antennas is based on the type of suspected feed lines and the relative location of the antennas to one another.

The pole spacing of 70 feet for the feed line to the probable transmitting antennas is acceptable for an open-feed transmission line but is at or above the maximum for a shielded line. 4/ The pole spacing of 35 feet for the feed line to the probable receiving antenna is compatible with either a balanced two/four wire or shielded cable lines. Since the feed lines to both antenna groups are close together, it may have been considered desirable to shield the receiving feed line.

End fire from the two horizontally polarized antennas is practically null, resulting in little or no interference with the reception qualities of the rhombic. If the rhombic were utilized for transmitting and the horizontally polarized antennas for receiving, side lobes from the rhombic could interfere with reception qualities of the horizontally polarized antennas.

Support Area

This area is single-fenced, contains a total of 69 structures, and is served by an improved road, a power line, and a telegraph/telephone line. It has family-type housing units and recreation facilities along with barracks and utility support facilities.

Major structures in the area include the following:

24 single-family-type housing units, 40 by 25 feet

2 single-family-type housing units, 45 by 35 feet

multistory administration-type building, 80 by 40 feet

3 barracks, 175 by 45, 140 by 35, and 60 by 35 feet

heating/auxiliary power plant, 60 by 60 feet, with nearby square possible cooling tower of wood construction

possible recreation building, 60 by 60 feet

10 warehouse/maintenance-type buildings ranging from 40 by 30 to 150 by 30 feet

possible vehicle-maintenance building, 50 by 40 feet
gatehouse, 25 by 20 feet

Other facilities in the area include an open storage section, a bulk storage section, a water tower, a possible water-treatment plant, and an ice-skating rink.

TEMNIKOV RADAR SITE

The radar site near Temnikov, covered by aerial photography of [redacted] 25X1D
25X1D [redacted] is located 15 nm west-southwest of the city at 54°31'N/42°49'E (Figure 1). The site is on level, wooded ground 525 feet above sea level and is served by an improved road from the village of Stantsiya Barashevo (54°32'N/42°52'E). This village is 3 nm east-northeast of the site and is a station on a spur line from the Moskovsko-Ryazanskaya railroad. The area surrounding the site is covered partially by dense stands of mature timber averaging 40-50 feet in height and partially by forest plantations from nursery-stock height up to 20 feet.

The site has two components (Figure 4): a double-fenced operations area and a single-fenced support area, one nm apart and connected by an improved road. No telegraph/telephone lines are evident. This site is very similar to the radar site near Michurinsk described above.

Operations Area

The double-fence around the operations area was originally in the shape of a trapezoid. A small triangle-shaped area was added at the southern corner, resulting in a jog in the two fences (Figure 5). The outer fence encloses an area of 129 acres. The area contains six radars, a probable radar mound under construction, an operations bunker, a gate-house, and operational support structures including a probable diesel power plant and a probable equipment-maintenance building -- all located along a road near the east fence. Probable transmitting and receiving antennas are located near the west fence. The area is covered with scattered

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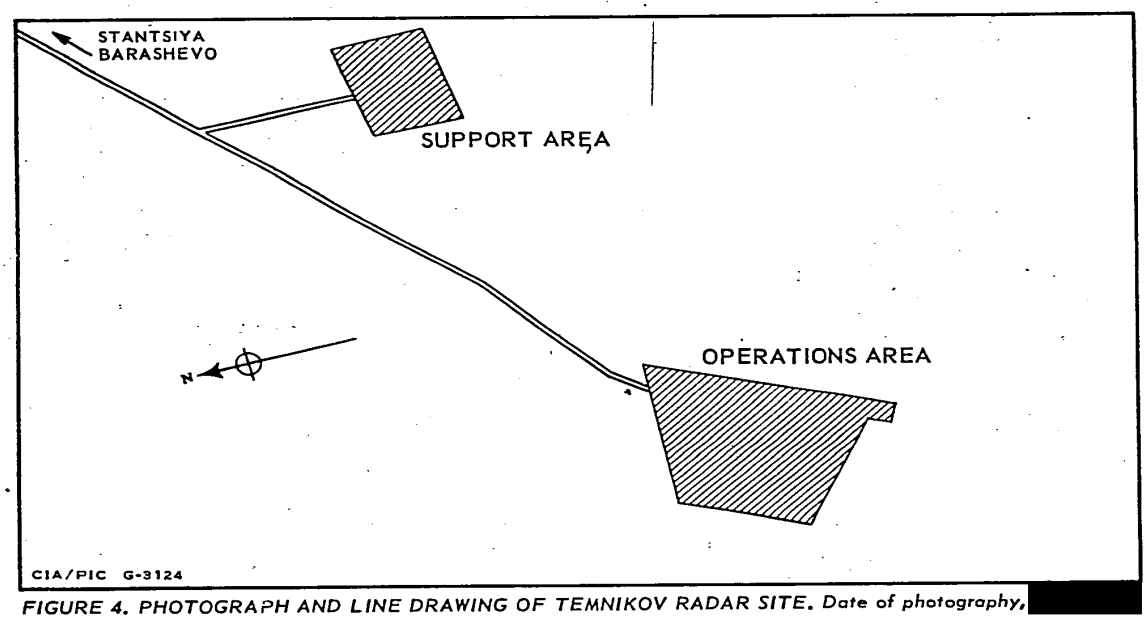


FIGURE 4. PHOTOGRAPH AND LINE DRAWING OF TEMNIKOV RADAR SITE. Date of photography, [redacted]

25X1D

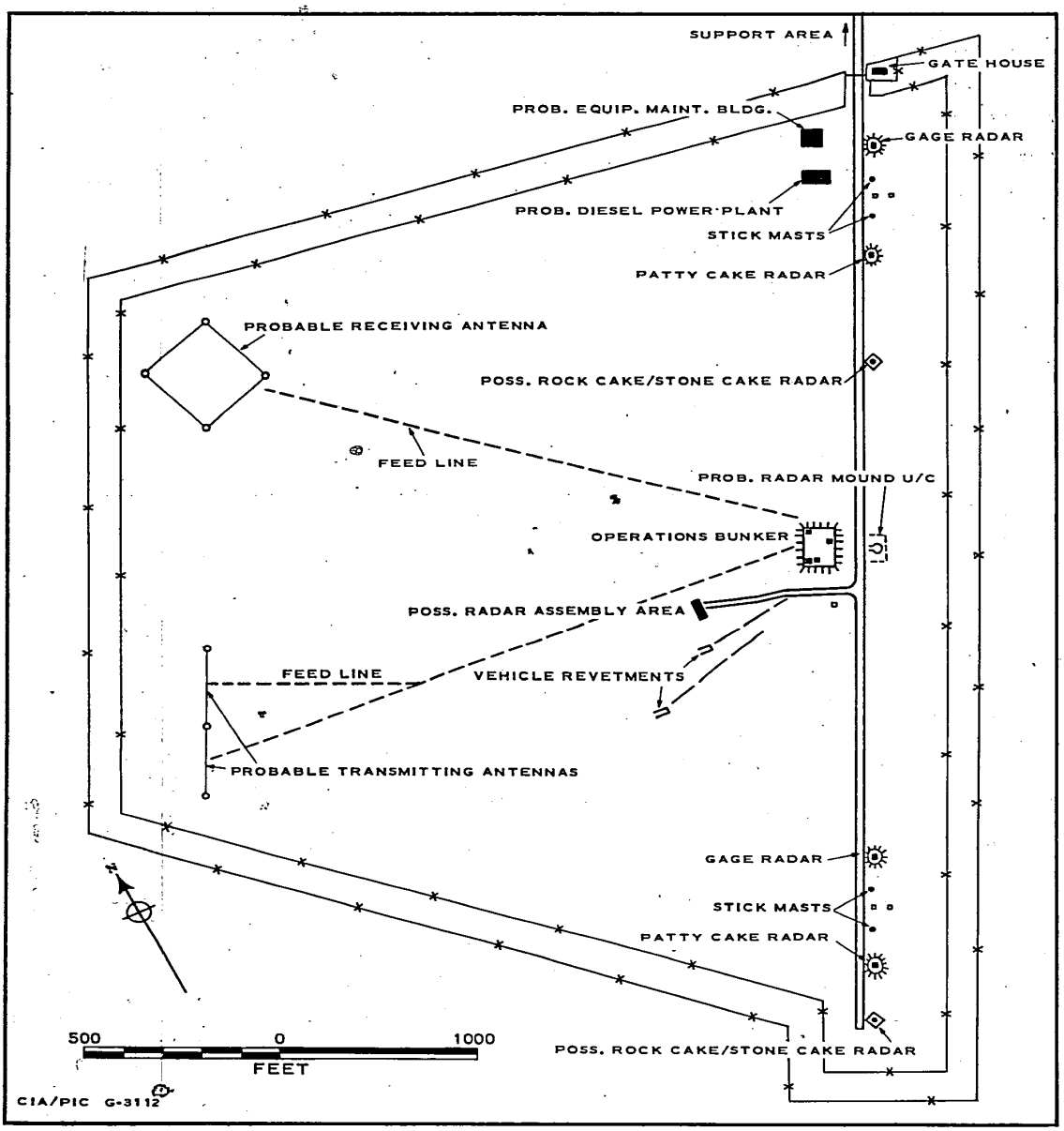


FIGURE 5. OPERATIONS AREA, TEMNIKOV RADAR SITE. This area originally had a trapezoid shape but the southern corner was extended to accommodate a radar.

remains of a forest plantation averaging from light cover near the radars to very dense cover near the communications antennas. The trees in this plantation are up to 20 feet in height. Within a radius of 1,650 feet of the radars, the only aboveground wire lines are two feed lines on 15-foot-high poles leading to the communications antennas from the operations bunker. Tent bases outside the fenced area could indicate recent construction.

Radars: The six radars in the area include two GAGE, two PATTY CAKE, and two possible ROCK CAKE/STONE CAKE. The dimensions of a probable radar mound under construction near the operations bunker approximate the dimensions of the mound at the Michurinsk site which supports a CROSS OUT/BAR LOCK. None of the radar reflectors has any apparent movement.

The GAGE and PATTY CAKE radars are in two groups and are positioned on individual mounds similar in design and dimensions to the mounds at the Michurinsk radar site. The mounds have similar entrances and probable ventilators, with adjacent stick masts and small structures.

The possible ROCK CAKE/STONE CAKE radars are on square, elevated platforms, each 40 feet high. The northernmost ROCK CAKE/STONE CAKE radar is on a platform 30 by 30 feet and is in the same ground position as its counterpart at the Michurinsk site. The other radar, on a platform 45 by 45 feet, is located south of the GAGE-PATTY CAKE group, resulting in the fence-line jog. Both platforms are supported on four vertical columns by interwoven lattice supports. One of the columns for each platform is road served and measures 10-15 feet in one horizontal dimension.

For the probable radar mound under construction there is a partial ground outline of the mound-base limits, with a bunker in the center. The bunker has an entrance on the road side and a slot in the roof from the entrance to the peak. A probable radar van possibly to be placed on the mound when completed is parked near the operations bunker.

Operations Bunker: The operations bunker is adjacent to the mid-point of the road through the operations area. Its design, dimensions, and external

features are similar to those of the operations bunker at the Michurinsk site.

25X1D Operational Support Structures: The probable diesel power plant and the probable equipment-maintenance building are similar to those at the Michurinsk site. A total of five small, [redacted] are scattered near the GAGE and PATTY CAKE radars. A single-story gable-roofed structure 45 by 15 feet is located 300 feet west of the operations bunker. The structure is served by an unimproved road and is partially enclosed by a fence. Parked nearby are two possible flat-bed trailers. This may be a radar-assembly area. Two vehicle revetments are in the vicinity.

Communications Antennas: The communications antennas, located in the northwest part of the area, include two probable transmitting antennas and a probable receiving antenna. Not all antenna masts and feed-line poles can be identified, owing to dense ground cover, but cleared areas indicate that those which cannot be identified probably exist.

Only one mast is visible in the transmitting-antenna group, but the cleared areas approximate the mast locations at the Michurinsk site. The feed-line poles, where visible, are spaced 70 feet apart. The cleared strip area for the feed line splits into two cleared strips, indicating feed lines similar to that at the Michurinsk site.

Three masts, each approximately 50 feet high, are visible in the receiving-antenna area. Cleared areas approximate a square configuration similar to that of the rhombic antenna at the Michurinsk site. The orientation of both antennas is approximately 295 degrees. The Kremlin (Moscow) is on an azimuth of 295 degrees at a distance of 195 nm from the site.

Support Area

The single-fenced support area contains a total of 75 structures and is served by an improved road. The facilities are similar to those at the Michurinsk site and include family-type housing units, barracks, and

recreation and utility facilities. Outside the fenced area are revetments, trenches, a rifle range, and an unused railroad bed.

Major structures in the area include the following:

- 24 single-family-type housing units, 40 by 25 feet
- 2 single-family-type housing units, 45 by 35 feet
- multistory administration-type building, 80 by 40 feet
- 5 barracks, 175 by 45, 140 by 35, 140 by 35, 70 by 35, and 70 by 35 feet
- heating/auxiliary power plant, 60 by 60 feet, with nearby square possible cooling tower
- possible recreation building, 60 by 60 feet
- 13 warehouse/maintenance-type buildings ranging from 40 by 30 to 150 by 30 feet
- possible vehicle-maintenance building, 50 by 40 feet
- gatehouse, 25 by 20 feet

SMOLENSK RADAR SITE

The radar site near Smolensk is located 8.2 nm west-northwest of the city near the village of Staryye Bateki at 54°49'N/31°49'E (Figure 1). The site is on level, brushy ground 650 feet above sea level, and is served by an improved road. The site is covered by aerial photography of [redacted] 25X1D
25X1C [redacted] The site has two components (Figure 6); a double-fenced operations area and a single-fenced support area, 0.7 nm apart and connected by an improved road 20 feet wide.

Operations Area

The operations area (Figure 7), secured by a double fence in the shape of a trapezoid, has outer fence lines 3,050, 2,400, 1,620, and 2,400 feet long
25X1C and covers 129 acres. The area in [redacted] contained four radars; [redacted], five 25X1D
25X1D radars; and in [redacted] seven radars. Also located in the area in [redacted] as an operations bunker, a gatehouse, a probable diesel power plant, a probable equipment-maintenance building, and two feed lines leading to probable

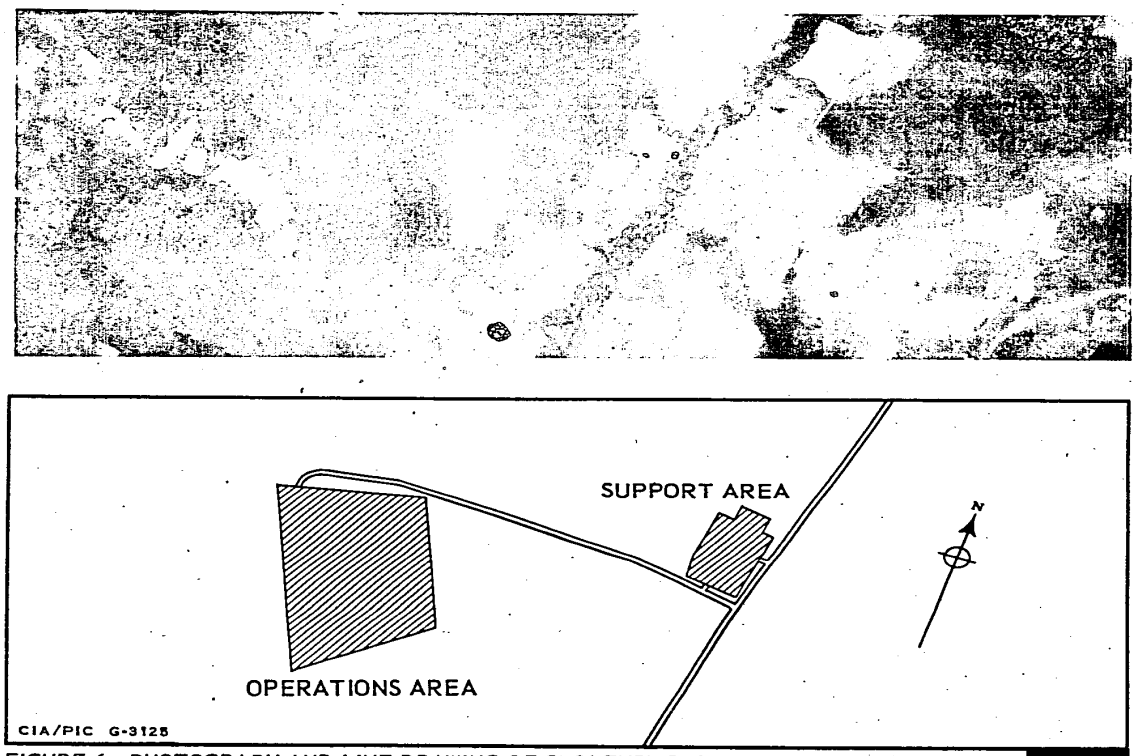


FIGURE 6. PHOTOGRAPH AND LINE DRAWING OF SMOLENSK RADAR SITE. Date of photography, [redacted] 25X1D

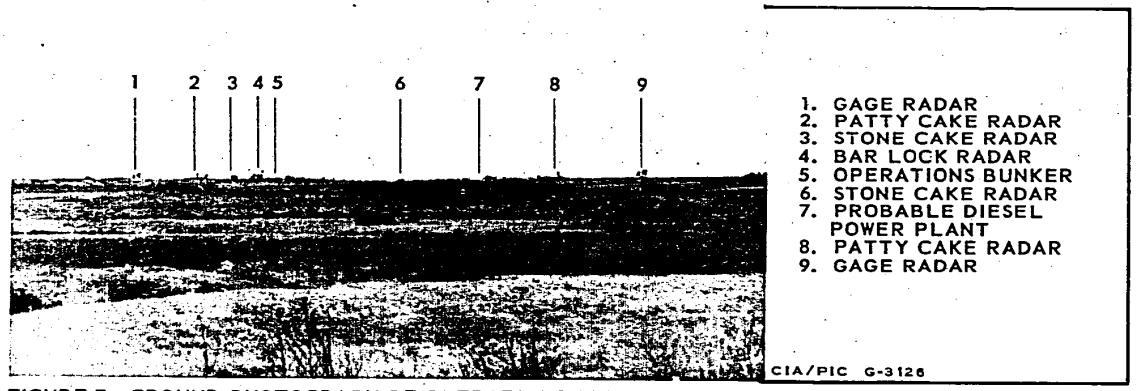


FIGURE 7. GROUND PHOTOGRAPH OF OPERATIONS AREA, SMOLENSK RADAR SITE. Date of photography, 25X1D [redacted]

communications antennas. The operations bunker and the diesel power plant are also identified on [redacted] photography. The area is similar to the operations areas of the sites near Michurinsk and Temnikov. 25X1D

Radars: The four radars in the area in [redacted] were two GAGE and two PATTY CAKE. The five radars in [redacted] were two GAGE, two PATTY CAKE, and one CROSS OUT/BAR LOCK. In [redacted] the seven radars were two GAGE, two PATTY CAKE, one BAR LOCK, and two STONE CAKE. 25X1D 25X1D 25X1D

The GAGE and PATTY CAKE radars, in all three years, have been on mounds similar in design to those at the Michurinsk and Temnikov sites and having similar accessory equipment (masts and small structures). The [redacted] coverage shows the GAGE radars to be revolving. The [redacted] photography shows attached WITCH-type interrogators on the GAGE. 25X1D 25X1D

Also, the [redacted] coverage shows that the BAR LOCK and STONE CAKE radars are in positions similar to those at the other radar sites. The BAR LOCK appears to be slightly elevated above the terrain. The elevation of the STONE CAKE positions cannot be determined. Neither of the radar reflectors appears to be revolving. 25X1D

Operations Bunker: The operations bunker is adjacent to the mid-point of the road through the operations area. Its design, dimensions, and external features are similar to those of the operations bunkers at Michurinsk and Temnikov.

Operational Support Structures: The probable diesel power plant and the probable equipment-maintenance building are similar to those at the other sites. [redacted] shows a single-story gable-roofed structure north of the operations bunker. 25X1C

Communications Antennas: Two of the stick masts, supporting communications antennas, are visible at this site on [redacted] Two feed lines lead toward the east fence from the operations bunker. These feed lines are in the same relative location as those leading toward the communications antennas at other sites. Six vertical antenna poles were reported east of the radars in [redacted] 5/ 25X1C

25X1C

Support Area

25X1D

The support area in [redacted] consisted of facilities similar to those in the support areas at the Michurinsk and Temnikov radar sites. A total of 55 structures are located in the area. Major structures include the following:

- 14 single-family-type housing units, 30 by 20 feet
- 13 single-family-type housing units, 35 by 25 feet
- multistory administration-type building, 90 by 35 feet
- 3 barracks, 175 by 60, 150 by 50, and 150 by 40 feet
- heating/auxiliary power plant, 65 by 50 feet, with nearby square possible cooling tower
- possible recreation building, 80 by 80 feet
- 10 warehouse/maintenance-type buildings ranging from 30 by 30 to 100 by 30 feet
- possible vehicle-maintenance building, 65 by 50 feet
- gatehouse, 25 by 20 feet

Other facilities in the area include a standpipe, bulk storage, open storage, a possible water-treatment plant, and an athletic field.

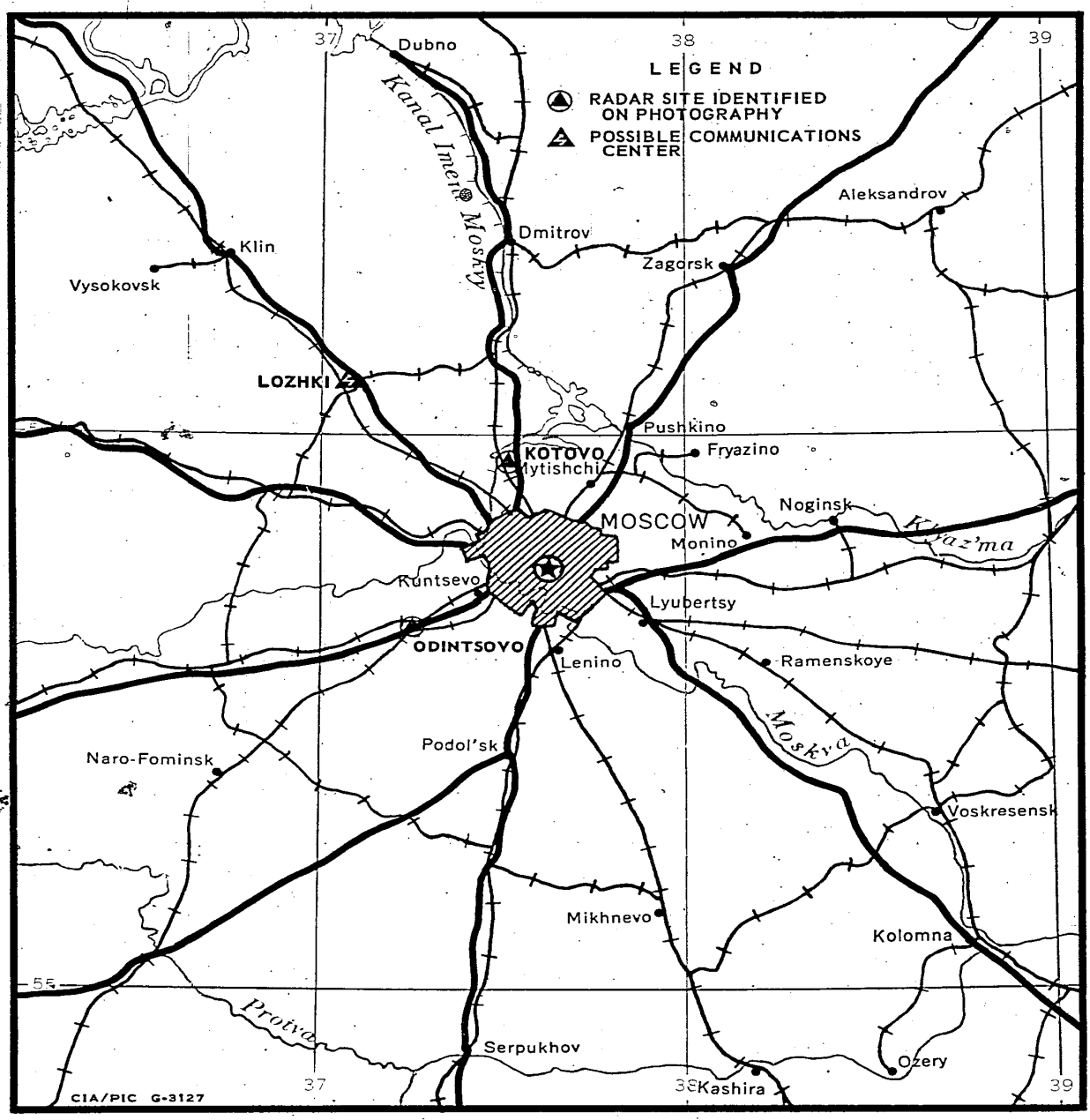
BRYANSK RADAR SITE

25X1D

The radar site near Bryansk, identified from ground photography of [redacted] is located 7 nm west of the city at approximately 53°13'N/34°11'E, near the village of Krasnaya Gorka (Figure 1). The site is on a cleared ridge at an approximate elevation of 620 feet. Visible facilities include two GAGE and two PATTY CAKE radars and an operations bunker. These radars are colocated in two groups, with the operations bunker in the middle. This pattern is similar to that at the other sites. A perpendicular to the line of radars is oriented toward Moscow.

14-NM RADAR SITES

The two radar sites 14 nm from Moscow are near Kotovo and Odintsovo (Figure 8). The Kotovo site was observed, reported, and photographed



27448 1-59 *FIGURE 8. MAP OF MOSCOW AREA SHOWING 14-NM SITES AND POSSIBLE COMMUNICATIONS CENTER.*

0 10 20 30 40

NAUTICAL MILES

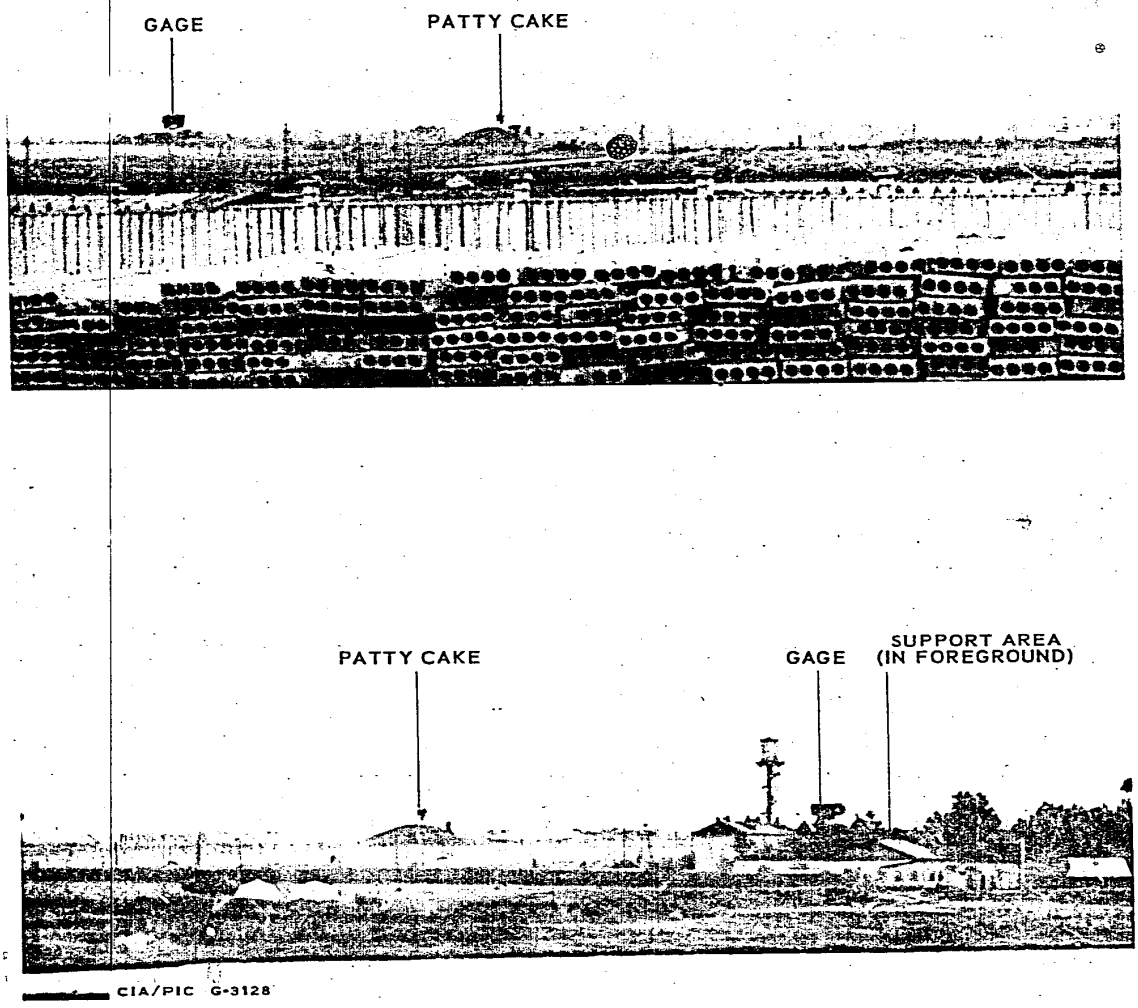


FIGURE 9. KOTOVO RADAR SITE. Photographs show the eastern portion (above) and the western portion (below). These views, oriented south, are from a boat on the Volga River Canal. Date of photography, [redacted]

25X1C

25X1C

25X1C [redacted] The Odintsovo site, first reported in [redacted] was reported and photographed numerous times from [redacted] In 25X1C
25X1C [redacted] each site had an operations area and a support area. The operations areas each contained eight radars and an operations bunker. The support areas are similar to those at the 200-nm sites.

KOTOVO RADAR SITE

The Kotovo radar site (Figure 9) is south of the east bank of the Moscow-Volga Canal between the highway and railroad bridge east of Kotovo, 12.9 nm north-northwest of the Kremlin, at 55°58'N/37°32'E. The operations area and support area are approximately 0.3 nm apart.

Operations Area

The operations area contains eight radars in a line and an operations bunker midway along the line. The radars are in the following order along the line: CROSS OUT, GAGE, PATTY CAKE, STONE CAKE, STONE CAKE, PATTY CAKE, GAGE, and CROSS OUT. The CROSS OUT and STONE CAKE radars are mounted on elevated platforms approximately 40 feet high supported by cylindrical brick towers. The GAGE and PATTY CAKE radars are on earth mounds similar to those at the 200-nm sites. The operations bunker appears similar to those at the other sites. A perpendicular line to the line of radars is oriented toward Moscow.

Support Area

The only part of the support area visible on photography includes some of the housing area, two barracks, and a water tower. These facilities appear similar to those at support areas at other sites.

ODINTSOVO RADAR SITE

The Odintsovo radar site (Figure 10) is 13.4 nm west-southwest of the Kremlin at 55°40'N/37°16'E. The site is on level cleared ground between

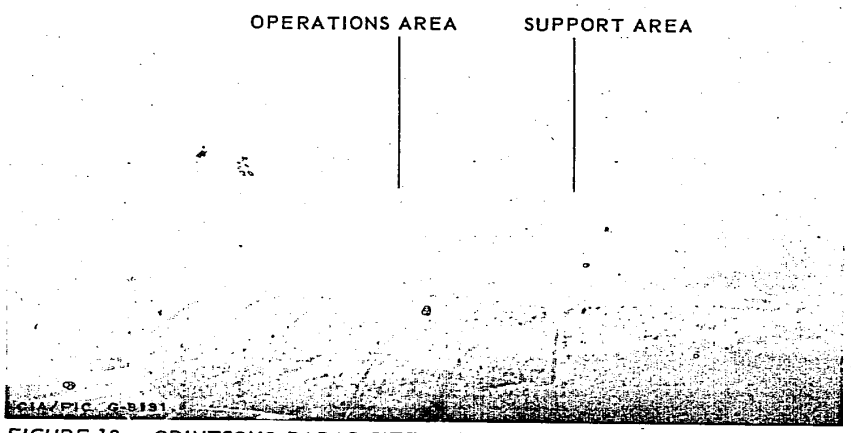


FIGURE 10a. ODINTSOVO RADAR SITE. This photograph shows that the site has a support area similar to those at the 200-nm sites. Date of photography, [redacted] 25X1C

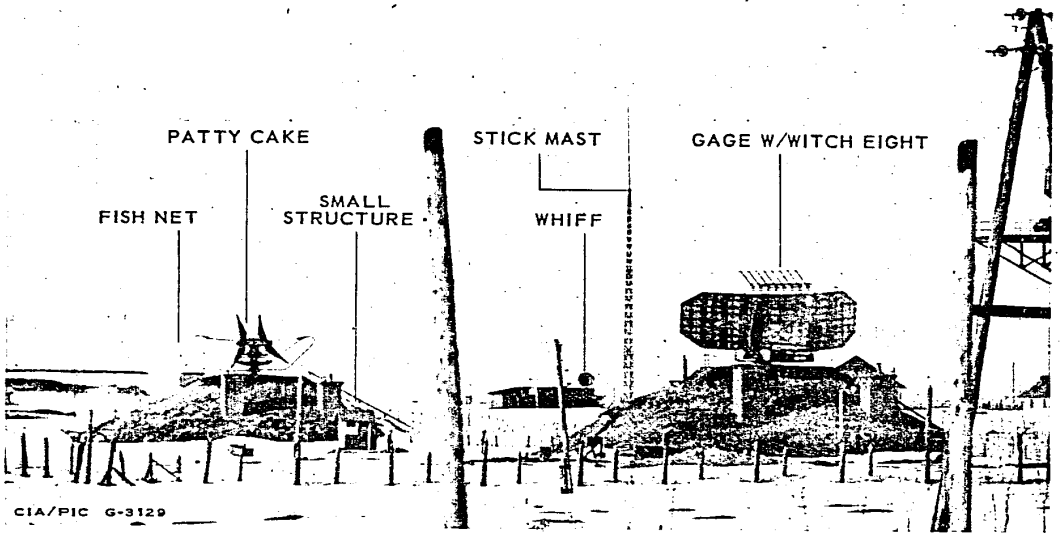


FIGURE 10b. PORTION OF OPERATIONS AREA, ODINTSOVO RADAR SITE. This photograph shows the relationship of the radars, mounds, stick masts, and small structures in a GAGE-PATTY CAKE radar group. Date of photography, [redacted]

25X1C

the railroad and road leading from Moscow to Golitsyno and is surrounded by the following villages: Odintsovo, Mamonovo, Akishevo, Akulovo, and Vnukovo.

25X1C

This site was first reported in [redacted] 6/ The site consists of a double-fenced operations area and a single-fenced support area, approximately 0.5 nm apart. The operations area is similar to that at the Kotovo site, and the support area is similar to those at the 200-nm sites.

Operations Area

This double-fenced area contains eight radars in a line with an operations bunker at the mid-point of the line, and at least two operational support structures.

25X1D The eight radars in [redacted] were in a line in the following order: CROSS OUT, GAGE, PATTY CAKE, STONE CAKE, STONE CAKE, PATTY CAKE, GAGE, and CROSS OUT. The CROSS OUT and STONE CAKE radars are mounted on elevated platforms approximately 40 feet high supported by cylindrical brick towers. Both CROSS OUT radars have END BOX attached to their upper reflectors. The GAGE and PATTY CAKE radars are on earth mounds similar to those at the other sites. Both GAGE radars have WITCH EIGHT identification, friend or foe (IFF) antennas attached to the reflector.

The GAGE and PATTY CAKE radars, at least during [redacted] 25X1C

25X1D [redacted] Some time

25X1D before [redacted] the netting was removed. Also prior to [redacted] stick masts, each 25X1D approximately 85 feet high, were installed between the radars. These masts are similar to those at the other sites.

Two possible radars, nicknamed DRUM HEAD and HOT PLATE, were

25X1D at the site in [redacted] DRUM HEAD was removed sometime in

25X1D [redacted] The purpose of each radar is unknown. DRUM HEAD is a pedestal-mounted parabolic open-mesh dish approximately 30 feet in diameter positioned on an earth mound. Its support is too low to permit a

horizon scan. The HOT PLATE resembles a small horn, fed by a wave guide, and is mounted on a lattice tower.

The operations bunker is similar in design and external characteristics to those at other sites. An entrance, visible on ground photography, appears to be large enough to permit vehicles to enter the bunker. A FISH NET IFF is located near one of the bunker ventilators.

The operational support structures appear similar to those at the other sites and include a probable diesel power plant, a probable equipment-maintenance building, and numerous smaller structures. A WHIFF radar is mounted on top of one smaller structure and a FISH NET IFF is mounted on another. Also present are numerous vans and unidentified stick masts.

Support Area

25X1D The support area is single-fenced and is similar to those at other sites. In [redacted] it contained 25 individual family-type housing units, an administration-type building, 2 barracks, a gatehouse, a water tower, and approximately 10 warehouse-type buildings. A construction camp consisting of numerous tents and other structures was nearby.

COMMUNICATIONS CENTER NEAR LOZHKI

A communications center possibly associated with the radar sites is located at 56°05'N/37°07'E, near Lozhki (Figure 8). Lozhki is on the Moscow-Leningrad highway, approximately 26 nm northwest of the Kremlin. The orientation azimuths of the communications antennas at the 200-nm sites intersect approximately near Lozhki.

25X1D The center has been reported by Western observers since [redacted]
25X1D and was photographed in [redacted]

CIA/PIC G-3130

FIGURE 11. COMMUNICATIONS CENTER NEAR LOZHKI. The support area is in the foreground, and the antenna farm is on the horizon. Date of photography, [redacted]
25X1D

25X1D

[redacted] The installation has an antenna farm and a support area (Figure 11). Although the center is mostly hidden from ground observers by heavy timber, the antenna farm is reported to contain rhombics, cage dipoles, and horizontal wires supported by 50-100 stick masts, each approximately 50 feet high. 7/, 8/ The reported antenna types and stick-mast heights at this center are compatible with antenna configurations and mast heights at the 200-nm radar sites. The support area contains multistory permanent buildings and a heating/power plant.

CONCLUSIONS

1. The radar sites as originally designed contained GAGE and PATTY CAKE radars. Subsequent additions included CROSS OUT, BAR LOCK, and STONE CAKE radars.
2. The Odintsovo radar site was the first reported site. This site was first reported in [redacted] 25X1C
3. A total of 10 radar sites may be deployed at 125-nm chord intervals on an arc with a 200-nm radius from Moscow.
4. All the sites have similar operations and support facilities.
5. Colocated GAGE and PATTY CAKE radars have not been identified at any other locations.
6. A communications center near Lozhki, 26 nm northwest of Moscow, is possibly the communications center for the radar sites.
7. The radar sites are probably associated with the Moscow air-defense system.

PIC/R-4/60

PHOTO DATA:

Michurinsk Radar Site

	Mission	Camera	Frames	Date	Scale
25X1D	[redacted]				

Temnikov Radar Site

	Mission	Camera	Frames	Date	Scale
25X1D	[redacted]				

Smolensk Radar Site

	Mission	Camera	Frames	Date	Scale
25X1D	[redacted]				

25X1C [redacted]

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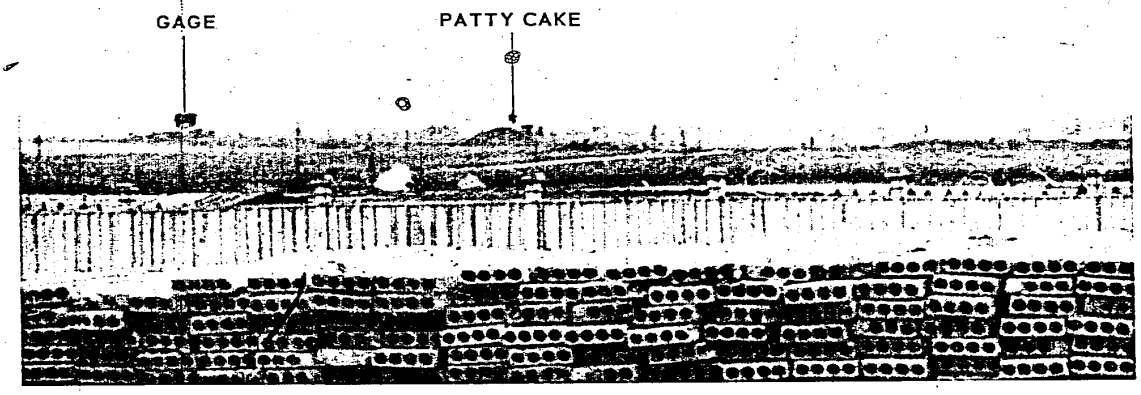

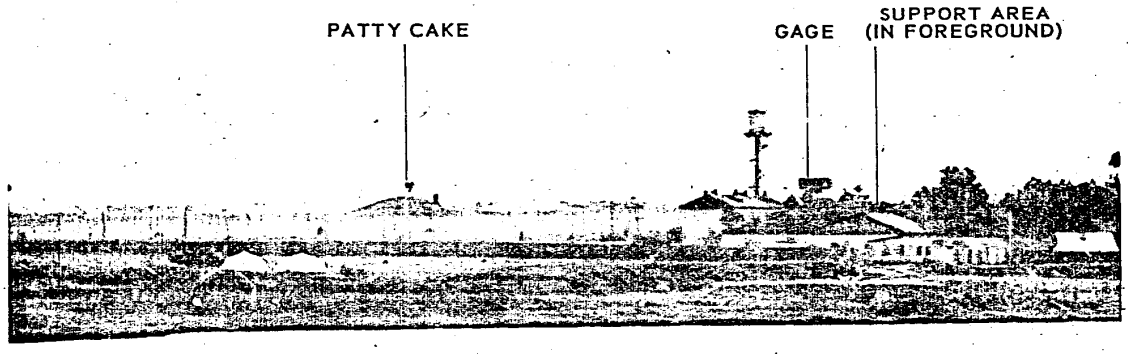

[redacted] CIA/PIC G-3128

FIGURE 9. KOTOVO RADAR SITE. Photographs show the eastern portion (above) and the western portion (below). These views, oriented south, are from a boat on the Volga River Canal. Date of photography, [redacted]

25X1C